# Two-sided Altruism and Level of Development

**Manachaya Uruyos and Siwapong Dheera-aumpon**

Using 24 countries' data on the estimated degrees of filial and parental altruism, we examine the relationship between the stages of economic development and degrees of altruism. We employ the ordinary least squares and two-stage least squares methods and generalized method of moments. We find that after controlling for macroeconomic, demographic, and institutional variables, developing countries are more filially altruistic than developed ones, whereas the latter are more parentally altruistic than the former.

*Keywords*: Altruism, Development, Demography, Public education
*JEL Classification*: D64, I28, J14, O10

## I. Introduction

Parents can attain utility not only from their consumption but also from their children's consumption. The motivation of having, nurturing, and educating children is called parental altruism, which is the intergenerational linkage examined by Becker and Barro (1988, 1989). In addition to this downward altruistic behavior, young adults also

Manachaya Uruyos, Corresponding Author, Faculty of Economics, Chulalongkorn University, Phayathai Road, Bangkok 10330, Thailand. (Email): manachaya.u@chula.ac.th, (Tel): +66-2-218-6180, (Fax): +66-2-218-6201; Siwapong Dheera-aumpon, Faculty of Economics, Kasetsart University, Ngam Wong Wan Road, Bangkok 10900, Thailand. (Email): fecospd@ku.ac.th, (Tel): +66-2-561-3474, (Fax): +66-2-579-8739, respectively.

The authors are grateful to the anonymous referees for thoughtful comments and to Narathorn Munsuvarn for his excellent research assistance. This research was funded by the Ratchadapisek Sompoch Endowment Fund (2015), Chulalongkorn University (CU-58-073-AS).

[**Seoul Journal of Economics** 2019, Vol. 32, No. 2]

spend resources in caring for their elderly parents. They do so because their parents' consumption directly increases their utility. Although filial altruism co-exists with parental altruism, it has not received research attention similar to that of parental altruism.

Are individuals more parentally or filially altruistic? Do the differences in degrees of altruism affect the levels of economic development? The majority of the literature on endogenous fertility assumes that young agents are altruistic toward children and bear children out of love (Becker and Barro 1988; Ehrlich and Lui 1991). Fewer studies suggest that when people are altruistic toward their elderly parents, they raise children as assets (Boldrin and Jones 2002; Nishimura and Zhang 1992, 1995). Although the abovementioned studies do not argue which types of altruism are prevalent in specific countries, Horioka (2014) find that Americans and Indians generally leave bequests due to parental altruism. Meanwhile, the Japanese and Chinese are concerned with self-interest and exchange bequests with old-age support. Blackburn and Cipriani (2005) studied fertility decisions when people are altruistic toward their children and parents. Their two-sided altruism model reveals that, as an economy develops, intergenerational transfers from children to parents are superseded by those from parents to children, thus leading to a decline in fertility. Their result implies that people in highly developed economies are parentally altruistic, whereas those in less developed economies are filially altruistic. Notably, dependent old agents do not exist in the two-period overlapping-generation model proposed by Blackburn and Cipriani (2005), and reciprocal transfers are conducted between two working groups, namely, young parents and their children.

According to Becker *et al.* (1990), the degree of parental altruism per child is negatively related to fertility rate. As countries develop, fertility rates decline, which in turn, increases the degree of parental altruism per child. In addition to one-way altruism, as mentioned in Becker *et al.* (1990), filial altruism can also be affected by demographic changes. According to the UN population division, the global fertility rate has halved over the last 50 years. Globally, the average woman has fewer than 2.5 children today. However, fertility rates in developing countries remain higher than those in developed countries. Having many children is rational for parents in less developed countries (especially with the low cost of child-rearing). The direction of intergenerational transfers then commences from children to parents. As a result, parental altru-

ism before adjustment by fertility rate should be higher in developing countries. However, in more developed countries where the opportunity cost of child-rearing increases, parents desire less children but spend extra time and other resources to enhance the quality of the children. Thus, the transfer is redirected from parents to children, and each child receives extra time and physical resources from parents. As countries develop and fertility rate is reduced, the degree of parental altruism *per child* increases.

According to Koda and Uruyos (2017), the large size of families (more siblings) in developing countries implies less burden for each individual in relation to caring for elderly parents, because this burden can be shared among many siblings. In addition, if the elderly parents have a longer life expectancy as evidenced in developed countries, the amount of old-aged caring will be higher in these countries. As a result, filial altruism, before adjustment by demographic variables, should be higher in developed countries. However, after removing the demographic variables, the degrees of filial altruism are higher in developing countries and lower in developed countries. Demographic variables, therefore, can have substantial effects on discount rates or weights placed by each individual on the utility of one's parents' and children's consumption.

We base our empirical analysis on the theoretical model developed by Koda and Uruyos (2017) with the goal of determining the relationship between the stages of economic development and preference parameters, namely, degrees of parental and filial altruism. Specifically, we tested whether (i) GDP per capita increases with the increase in parental altruism, and (ii) GDP per capita decreases with the increase in filial altruism. In this study, we investigate how the degrees of parental and filial altruism affect the stages of economic development. The dependent variable is GDP per capita, and the explanatory variables are parental and filial altruism, which are controlled by macroeconomic, demographic, and institutional variables. To estimate the abovementioned relationship, we employed the ordinary least squares (OLS) method with heteroscedasticity robust standard errors. To overcome a possible endogeneity problem, we employed the two-stage least squares (2SLS) method and generalized method of moments (GMM). Institutional collectivism values, in-group collectivism values, and linguistic fractionalization were selected as instrumental variables for parental and filial altruism.

In this study, we find that levels of development are associated positively with degrees of parental altruism. However, these levels are negatively associated with the degrees of filial altruism, as highlighted in Blackburn and Cipriani (2005) and Koda and Uruyos (2017).[1] The results are robust across various models of estimation and hold even after accounting for the possible endogeneity problem of altruism. The intuition behind these results is as follows. When the relationship between the degree of parental altruism and level of development is revealed, it has not been adjusted by demographic differences across countries. Individuals in less developed countries are more likely to have high fertility rates, which automatically increase the weight that they assign to their children's consumption in their utility function. This weight, in turn, leads to large parental altruism in less developed countries. Conversely, with low fertility rates and longer longevity in highly developed countries, a positive relationship between filial altruism and levels of development is highly likely. Specifically, lower fertility rates and higher longevity in developed countries will result in an increase in the overall weight placed by individuals on their parent's consumption. Nevertheless, after adjusting for demographic differences, a negative relationship between degree of filial altruism and levels of development is clearly seen. The low degree of parental altruism and high degree of filial altruism in developing countries are thus driven by high fertility and short life expectancy.

The remainder of the paper is organized as follows. Section II presents the concept and calculates the degrees of altruism using the National Transfer Accounts (NTA) data. Section III describes the empirical methodology and data. Section IV presents the empirical results. Section V concludes the paper.

## II. Degrees of Parental and Filial Altruism

This section presents the main concept of the degrees of altruism, as

[1] Koda and Uruyos (2017) mainly discussed "demographically adjusted degrees of altruism," which are different from the definition used in this paper. Furthermore, their conclusion is opposite to our results. In their paper, the adjusted degree of parental altruism (adjusted by demographic factors) decreases with the level of development, whereas that of filial altruism is positively related to levels of economic development.

presented in Koda and Uruyos (2017). Their model introduces the less-examined filial altruism that motivates sizable and increasing transfers to the elderly in addition to parental altruism that motivates transfers to children.

Koda and Uruyos (2017) developed a three-period overlapping-generation model, wherein middle-aged agents care not only about their lifetime utility but also that of their old parents' and children's well-being. The economy consists of infinite generations of agents with perfect foresight. Each agent goes through three periods in a lifetime: child, young parent, and old parent. A representative agent derives utility from her young- and old-age consumption and from the old-age consumption of her parent and child-period consumption of her children. For the representative agent born in period $t-1$, her utility function is given by:[2]

$$U^{t-1} = \ln c_t^y + \beta\theta_{t+1} \ln c_{t+1}^o + \alpha^F \frac{\theta_t}{1+n_{t-1}} \ln c_t^o + \alpha^P \left(1+n_t\right) \ln c_t^c, \qquad (1)$$
$$0 < \beta < 1, \qquad 0 \le \alpha^F, \qquad 0 \le \alpha^P,$$

where $\beta$ denotes the discounted rate of the agent's old-age consumption, $\theta_{t+1}$ denotes the length of old-age period, $1 + n$ pertains to fertility rate, and $\alpha^F$ and $\alpha^P$ denote the degrees of filial and parental altruism, respectively. The first two terms represent self-consumption when an agent is young parent and old parent. The last two terms represent the altruism characteristics of this model. The third term represents an emotional benefit to the agent from the concurrent old-age consumption of her elderly parent $C_t^0$. Notably, the weight placed by each individual on the consumption of her parents does not only depend on the degree of filial altruism $\alpha^F$, but also on the length of old-age period $\theta_{t+1}$ and past fertility rate $1 + n_{t-1}$. The fourth term represents an emotional benefit from consumption of her children multiplied by the weight she puts on consumption of her children. This term does not only depend on the degree of parental altruism $\alpha^P$, but also on current fertility rate $1 + n_t$. Towards a fair comparison of the degrees of filial and parental altruism across countries, the demographic characteristics of each country

[2] Superscripts *y* and *o* denote young and old parents, respectively. A subscript denotes period.

**TABLE 1**
PRIVATE AND PUBLIC TRANSFERS, DEMOGRAPHIC DATA, AND PARENTAL AND FILIAL ALTRUISM

| Countries | Year | (1) b/w | (2) bp/w | (3) g/w | (4) gp/w | (5) n1 | (6) n2 | (7) $\alpha^P$ | (8) $\alpha^F$ |
|---|---|---|---|---|---|---|---|---|---|
| Argentina | 1997 | 0.189 | 0.110 | 0.130 | 0.449 | 3.177 | 2.713 | 0.874 | 5.461 |
| Australia | 2010 | 0.202 | 0.182 | 0.010 | 0.301 | 2.577 | 1.838 | 1.006 | 2.882 |
| Austria | 2010 | 0.211 | 0.140 | −0.003 | 0.530 | 2.150 | 1.422 | 0.984 | 3.412 |
| Brazil | 1996 | 0.380 | 0.061 | −0.225 | 0.887 | 4.914 | 2.499 | 1.540 | 11.078 |
| Cambodia | 2009 | 0.291 | 0.030 | 0.158 | 0.043 | 6.323 | 4.452 | 1.204 | 53.030 |
| Chile | 1997 | 0.354 | 0.075 | 0.070 | 0.430 | 3.768 | 2.216 | 1.445 | 6.155 |
| China | 2002 | 0.231 | 0.083 | 0.120 | 0.160 | 4.627 | 1.859 | 0.574 | 4.324 |
| Colombia | 2008 | 0.122 | 0.083 | 0.844 | 0.466 | 5.219 | 2.613 | 0.430 | 8.559 |
| Costa Rica | 2004 | 0.317 | 0.082 | 0.027 | 0.429 | 4.620 | 2.649 | 1.447 | 7.190 |
| Finland | 2006 | 0.150 | 0.240 | 0.012 | 0.562 | 1.984 | 1.759 | 1.645 | 5.165 |
| France | 2011 | 0.232 | 0.224 | −0.043 | 0.469 | 2.360 | 1.845 | 1.699 | 4.264 |
| Germany | 2003 | 0.238 | 0.148 | −0.056 | 0.569 | 1.883 | 1.355 | 1.223 | 3.493 |
| Hungary | 2005 | 0.172 | 0.243 | 0.022 | 0.389 | 1.966 | 1.524 | 0.993 | 3.094 |
| India | 2004 | 0.302 | 0.030 | 0.112 | 0.029 | 5.362 | 3.541 | 0.912 | 15.920 |
| Indonesia | 2005 | 0.356 | 0.062 | −0.083 | 0.011 | 5.102 | 2.795 | 1.142 | 9.122 |
| Italy | 2008 | 0.312 | 0.196 | −0.037 | 0.554 | 2.166 | 1.306 | 1.862 | 4.264 |
| Jamaica | 2002 | 0.283 | 0.088 | 0.361 | 0.057 | 4.832 | 2.697 | 1.084 | 7.093 |
| Japan | 2004 | 0.295 | 0.209 | 0.040 | 0.473 | 1.950 | 1.446 | 2.509 | 5.348 |
| Mexico | 2004 | 0.392 | 0.095 | −0.111 | 0.245 | 6.053 | 3.022 | 2.549 | 13.168 |
| Peru | 2007 | 0.333 | 0.144 | −0.165 | 0.648 | 5.990 | 3.271 | 3.764 | 27.665 |
| Philippines | 1999 | 0.357 | 0.062 | 0.138 | −0.003 | 6.026 | 3.939 | 3.084 | 28.303 |
| Slovenia | 2004 | 0.272 | 0.167 | 0.017 | 0.481 | 2.177 | 1.378 | 1.218 | 3.566 |
| S. Africa | 2005 | 0.214 | 0.136 | −0.094 | 0.048 | 5.399 | 3.168 | 0.823 | 25.651 |
| S. Korea | 2000 | 0.374 | 0.121 | 0.137 | 0.147 | 4.031 | 1.435 | 1.059 | 3.881 |
| Spain | 2000 | 0.291 | 0.088 | −0.069 | 0.315 | 2.640 | 1.325 | 0.811 | 2.159 |
| Sweden | 2003 | 0.227 | 0.210 | −0.081 | 0.729 | 1.942 | 1.799 | 3.978 | 11.135 |
| Taiwan | 1998 | 0.372 | 0.158 | 0.300 | 0.176 | 3.692 | 1.527 | 1.458 | 4.889 |
| Thailand | 2004 | 0.312 | 0.112 | 0.260 | −0.006 | 4.874 | 1.866 | 0.902 | 5.347 |
| UK | 2007 | 0.272 | 0.107 | −0.002 | 0.338 | 2.259 | 1.763 | 0.997 | 2.788 |
| USA | 2003 | 0.238 | 0.177 | −0.067 | 0.311 | 2.351 | 2.008 | 1.167 | 2.856 |
| Uruguay | 2006 | 0.433 | 0.086 | −0.121 | 0.466 | 2.840 | 2.334 | 2.485 | 6.694 |

Sources: NTA and World Development Indicators

Notes: Per capita transfers are normalized as the shares of average labor income. Total fertility rates are divided by two.

should be primarily factored out to attain the pure degrees of filial and parental altruism.

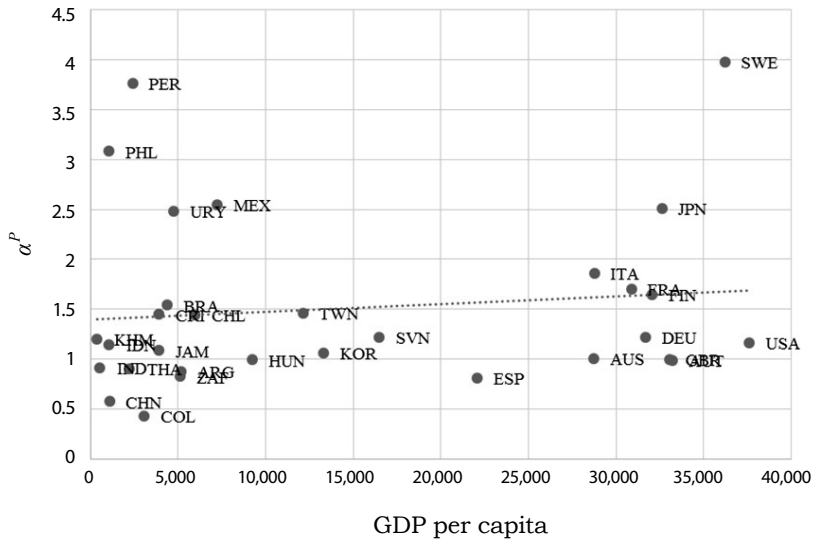
A young parent's education capital increases with inter-vivos bequests $b_t$, which she received from her parents during her childhood and public transfers to children $b_p$. Upon reaching her old parenthood, the same agent receives private transfers from her grown-up children $g_t$ and public transfers paid to the old parent $g_p$.

The data compiled by the National Transfer Accounts (NTA) provide us with important insights into intergenerational transfers in 31 countries in the system. The normalized per capita transfers in the form of income shares of the countries in the NTA system are presented in columns 1-4 of Table 1. Fertility rates of the current and previous generations are shown in columns 5 and 6. The degrees of altruism toward the elderly and children, denoted as $\alpha^F$ and $\alpha^P$, respectively, were derived from the system of Equations (18) and (19) in Koda and Uruyos (2017), as presented in columns 7 and 8.

Figures 1 and 2 show the simple relations between the levels of development proxied by the logarithm of income per capita and the calculated degrees of parental and filial altruism, namely, $\alpha^P$ and $\alpha^F$, respectively. Parental altruism values have an ambiguous relationship across countries through different stages of development. In Figure 1, Sweden has the highest parental altruism at 3.98, whereas Colombia has the lowest at 0.43. Roman Catholic countries, such as Peru, Philippines, Uruguay, and Mexico, have exceptionally high degrees of parental altruism. Interestingly, the degrees of filial altruism vary considerably, which may be caused by cultural differences. Figure 2 shows that the country with the highest degree of filial altruism is Cambodia at 53.03, whereas Spain has the lowest at 2.16. Accordingly, developing countries have higher degrees of filial altruism compared with developed countries, and this finding is in line with the results in Blackburn and Cipriani (2005) and Koda and Uruyos (2017).

The next section considers the empirical determinants of levels of development, that is, the regression results that underlie the fitted values, as shown in Figure 1 and 2.

Based on the two relationships between degrees of altruism and levels of development in Figure 1 and 2, the following hypotheses will be tested.




Source: WDI and Koda and Uruyos (2017)

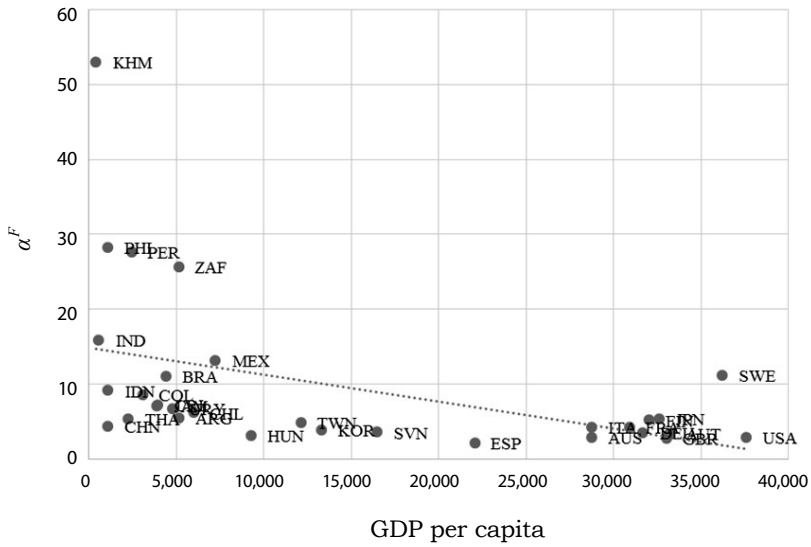
**FIGURE 1**
DEGREES OF PARENTAL ALTRUISM

**Hypothesis 1**. The level of economic development is positively related to the degree of parental altruism.[3]

**Hypothesis 2**. The level of economic development is negatively related to the degree of filial altruism.

To validate these hypotheses, we perform multiple regression analysis.

[3] Although we fail to see a clear relationship between GDP per capita and degrees of parental altruism, we hypothesize a positive relationship between them. As parents care more about the quality of their children, they tend to allocate more time on nurturing, nourishing, and educating to ensure that their children will be endowed with the ability to survive and take on advanced tasks in their adulthood. As a result, the GDP per capita should increase with the increase in parental altruism.




Source: WDI and Koda and Uruyos (2017)

**FIGURE 2**
DEGREES OF FILIAL ALTRUISM

## III. Data and Methodology

*A. Data*

The sample of 31 countries (Table 1) covers a broad range of experience from developing to developed countries. The inclusive countries were determined based on the availability of the NTA data. To evaluate the impact of degrees of altruism on levels of development, we assembled a data set from 1996-2011 from various sources, such as the (i) World Development Indicators (WDI) from the World Bank, (ii) the NTA Project, (iii) the Polity IV Project from the Integrated Network for Societal Conflict Research, (iv) the World Factbook from the Central Intelligence Agency (CIA), (v) the Global Leadership and Organizational Behavior Effectiveness (GLOBE) project, and (vi) the data of Alesina *et al.* (2003). The dependent variable is the natural logarithm of GDP per capita, which is averaged from 1996-2011. The main explanatory variables are the degrees of parental and filial altruism. The control variables consist of macroeconomic variables, such as physical capital

**TABLE 2**

CROSS-COUNTRY DESCRIPTIVE STATISTICS FOR EACH VARIABLE

| Variable | Observation | Mean | Standard Deviation | Min | Max |
|---|---|---|---|---|---|
| Dependent variable | | | | | |
| *GDPpc* | 24 | 9.30 | 1.27 | 6.60 | 10.62 |
| Explanatory variables | | | | | |
| *ParentalAlt* | 24 | 1.44 | 0.84 | 0.43 | 3.98 |
| *FilialAlt* | 24 | 6.95 | 5.83 | 2.16 | 28.30 |
| *Physical Capital* | 24 | 25.58 | 1.57 | 22.21 | 28.56 |
| *Human Capital* | 24 | 49.75 | 22.42 | 12.25 | 86.81 |
| Macroeconomic variables | | | | | |
| *Inflation_lag* | 24 | 64.16 | 182.46 | 2.20 | 772.85 |
| *Sav/GDP_lag* | 24 | 23.85 | 5.65 | 14.14 | 36.95 |
| *Pubed/GDP_lag* | 22 | 5.78 | 11.11 | −0.09 | 53.99 |
| Demographic variables | | | | | |
| *Popgr_lag* | 24 | 1.30 | 0.90 | 0.07 | 2.73 |
| *Fert_lag* | 24 | 2.91 | 1.21 | 1.60 | 5.27 |
| Institutional variables | | | | | |
| *Polity* | 24 | 8.54 | 3.45 | −7 | 10 |
| *Catholic* | 24 | 0.46 | 0.51 | 0 | 1 |
| Instrumental variables | | | | | |
| *Institutional Collectivism Values* | 24 | 4.75 | 0.49 | 3.84 | 5.57 |
| *In-Group Collectivism Values* | 24 | 5.64 | 0.30 | 5.12 | 6.25 |
| *Linguistic Fractionalization* | 24 | 0.25 | 0.27 | 0.00 | 0.84 |

Sources: WDI, NTA Project, Polity IV Project, CIA World Factbook, Alesina *et al.* (2003), and GLOBE Project

and human capital stocks, lagged inflation rate, lagged saving ratio, and lagged public education expenditure to GDP ratio. The demographic variables include total fertility rate and population growth rate of the previous generation. Institutional variables consist of Polity index and a dummy variable for a country with Catholics as the dominant religious group, and the instrumental variables include the institutional collectivism values, in-group collectivism values, and linguistic fractionalization. To resolve the possible endogeneity of inflation

rate, saving ratio, and public education expenditure to GDP ratio, their lagged values were used. The combined dataset consisted of 24 countries. Cambodia, Chile, Jamaica, Peru, South Africa, Taiwan, and Uruguay were excluded due to missing data. Table 2 provides the cross-country descriptive statistics of each variable. Appendix Table 1 in the Appendix presents the definitions and sources of all variables.

*B. Methodology*

The level of development is assumed to be described by the following equation:

$$GDPpc_i = \beta_0 + \beta_1 ParentalAlt_i + \beta_2 FilialAlt_i + \boldsymbol{\beta_3 Controls_i} + \varepsilon_{1i} \qquad (2)$$

where subscript $i$ indicates country; $\beta_1$ and $\beta_2$ are the coefficients of the interested degrees of parental ($ParentalAlt_i$) and filial altruism ($FilialAlt_i$), respectively; and $\boldsymbol{\beta_3}$ is a coefficient vector of macroeconomic, demographic, and institutional control variables. To estimate the abovementioned equation, the OLS method with heteroscedasticity robust standard errors is used.

To overcome a possible endogeneity problem, we developed an IV strategy to estimate the causal effect of altruism on GDP per capita ($GDPpc_i$). The instrumental variables include the following: (i) institutional collectivism values, which is the degree to which organizational and societal institutional practices encourage and reward the collective distribution of resources and collective action. Societies with high institutional collectivism values appreciate these characteristics, and their members assume that they are highly interdependent with the organization. Furthermore, group loyalty is encouraged, even if this undermines the pursuit of individual goals. The society's economic system tends to maximize the interests of collectives. whereas rewards are driven by seniority, personal needs, and/or within-group equity. (ii) In-group collectivism values refer to the degree to which individuals express pride, loyalty, and cohesiveness in their organizations or families (House *et al.* 2004, p. 30). Societies with high in-group collectivism values appreciate these characteristics. Duties and obligations are important determinants of social behavior. A strong distinction is made between in- and out-groups, and as such, people emphasize relatedness with groups. A society with high values of these

two variables may tend to care more about their children. (iii) Linguistic fractionalization refers to the probability that two randomly selected people from a given country do not belong to the same ethnolinguistic group. Early work on social identity theory established that patterns of intergroup behavior can be understood considering that individuals may attribute positive utility to the wellbeing of members of their own group, and negative utility to that of members of other groups. Higher fractionalization, which reflects a diversity society, may have had the effect of enhancing filial altruism. These variables are chosen as instrumental variables in the current study because they are highly correlated with degrees of parental and filial altruism. However, they are less likely to be determined by GDP per capita and vice versa. These variables should satisfy the inclusion and exclusion restrictions of the instrumental variables.

Accordingly, the IV model takes the following form:

$$ParentalAlt_i = \alpha_0 + \boldsymbol{\alpha_1 Instruments_i} + \boldsymbol{\alpha_2 Controls_i} + \varepsilon_{2i} \quad (3)$$

$$FilialAlt_i = \gamma_0 + \boldsymbol{\gamma_1 Instruments_i} + \boldsymbol{\gamma_2 Controls_i} + \varepsilon_{3i} \quad (4)$$

$$GDPpc_i = \beta_0 + \beta_1 \widehat{ParentalAlt}_i + \beta_2 \widehat{FilialAlt}_i + \boldsymbol{\beta_3 Controls_i} + \varepsilon_{4i}, \quad (5)$$

where Equations (3) and (4) are the first-stage regressions for the degrees of parental ($ParentalAlt_i$) and filial ($FilialAlt_i$) altruism, respectively. Equation (5) is the second-stage regression of the natural logarithm of GDP per capita ($GDPpc_i$). $\boldsymbol{Instruments_i}$ is the set of instrumental variables, such as institutional collectivism, in-group collectivism, and linguistic fractionalization. $\boldsymbol{Controls_i}$ refers to the set of macroeconomic, demographic, and institutional controls. The coefficients of interest are $\beta_1$ and $\beta_2$. To estimate the abovementioned equations, the 2SLS method and GMM are employed because they are core methods for dealing with endogenous variables.

## IV. Regression Results

This section presents the results from a regression of the stages of economic development, measured by the natural logarithm of GDP per capita (*GDPpc*) on the degrees of parental (*ParentalAlt*) and filial (*FilialAlt*) altruism from 24 countries. Table 3 contains the regression

results for GDP per capita from 8 regression specifications. Each group of 3 columns in Table 3 shows the estimates for each regression specification obtained from three estimation methods, namely, OLS, 2SLS, and GMM.

We begin by employing the basic Solow model augmented with human capital, which has been widely used in the literature on empirical growth to explain differences across countries in income levels and growth patterns. The model is based on a simple Cobb-Douglas production function with physical and human capital stocks. This simple model (the first specification) is denoted under the first three columns in Table 3, where only *Physical Capital* and *Human Capital* enter the regressions.

In the second to fourth specifications, macroeconomic variables, such as lagged inflation rate (*Inflation_lag*) (columns 4-6), lagged saving ratio (*Sav/GDP_lag*) (columns 7-9), and lagged public education expenditure to GDP ratio (*Pubed/GDP_lag*) (columns 10-12) individually enter the regressions. The lagged variables are used instead of the current ones to avoid the negative control problem in which they are possibly outcomes of the current levels of altruism. The rate of inflation captures the effect of monetary stability on the economy such that the coefficient is expected to be negative. Lagged saving ratio captures the process of physical capital accumulation, such that the coefficient is expected to be positive. Lagged public education expenditure to GDP ratio captures the process of human capital accumulation such that its coefficient is expected to be positive.

In the fifth and sixth specifications, demographic variables, such as the previous-generation values of population growth rate (*Popgr_lag*) (columns 13-15) and total fertility rate (*Fert_lag*) (columns 16-18) individually enter the regressions. Their coefficients are expected to be negative, because the higher rate of population growth from the previous generation may discourage investment in human and physical capital stocks such that GDP per capita is lowered.

In the last two specifications, institutional variables, such as *Polity* (columns 19-21) and *Catholic* (columns 22-24), individually enter the regressions. A better institutional environment, including a higher level of democracy, should promote economic development such that the coefficient of *Polity* is expected to be positive. In our sample set, which includes various religious compositions, countries with Catholics as a dominant religious group tend to have relatively better institutional en-

**TABLE 3**

REGRESSIONS OF GDP PER CAPITA ON THE DEGREES OF ALTRUISM

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | OLS | 2SLS | GMM | OLS | 2SLS | GMM |
| *ParentalAlt* | 0.707*** | 0.676** | 0.735*** | 0.709*** | 0.686** | 0.745*** |
| | (0.150) | (0.298) | (0.257) | (0.155) | (0.299) | (0.259) |
| *FilialAlt* | −0.125*** | −0.172*** | −0.194** | −0.126*** | −0.173*** | −0.195*** |
| | (0.023) | (0.058) | (0.077) | (0.024) | (0.052) | (0.064) |
| *Physical Capital* | 0.133** | 0.089 | 0.098* | 0.133** | 0.090 | 0.099* |
| | (0.055) | (0.084) | (0.057) | (0.056) | (0.080) | (0.052) |
| *Human Capital* | 0.027*** | 0.020** | 0.017 | 0.027*** | 0.021** | 0.017* |
| | (0.007) | (0.010) | (0.010) | (0.007) | (0.009) | (0.009) |
| *Inflation_lag* | - | - | - | 0.000 | 0.000 | 0.000 |
| | | | | (0.001) | (0.001) | (0.001) |
| *Constant* | 4.432*** | 6.227** | 6.277*** | 4.424*** | 6.182*** | 6.224*** |
| | (1.492) | (2.542) | (1.894) | (1.535) | (2.346) | (1.593) |
| *N* | 24 | 24 | 24 | 24 | 24 | 24 |
| adj. $R^2$ | 0.84 | 0.80 | 0.77 | 0.83 | 0.79 | 0.76 |
| RMSE | 0.507 | 0.510 | 0.547 | 0.521 | 0.507 | 0.545 |
| F-stat first stage (p-value) | - | 0.023, 0.059 | - | - | 0.030, 0.027 | - |
| Underidentification (p-value) | - | 0.049 | - | - | 0.017 | - |
| Overidentification (p-value) | - | 0.373 | - | - | 0.385 | - |
| Endogeneity (p-value) | - | 0.429 | - | - | 0.302 | - |

Notes: Robust standard errors are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% levels, respectively. F-stat first stage is the joint probability of an F-test for the first stage regression. Underidentification is the probability of a test for underidentification restrictions (null hypothesis: underidentified). Overidentification is the probability of a test for overidentification restrictions (null hypothesis: instruments are valid). Endogeneity is the probability of the Wu-Hausman test for endogeneity (null hypothesis: regressors are exogenous).

vironment. The coefficient of *Catholic*, therefore, is expected to be positive as well.

The F-statistics from the first stage regressions indicate that the instrumental variables enter the first stage regressions significantly. The underidentification test also rejects the null hypothesis of underidentified. In other words, the inclusion restrictions are satisfied, which suggests that the instrumental variables are relevant or correlates with the degrees of altruism. We can, therefore, believe that the instruments are not weak, and the 2SLS estimator is able

**TABLE 3**
(CONTINUED)

| | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|
| | OLS | 2SLS | GMM | OLS | 2SLS | GMM |
| *ParentalAlt* | 0.761*** (0.143) | 0.749*** (0.261) | 0.741*** (0.228) | 0.660*** (0.124) | 0.558*** (0.210) | 0.567*** (0.205) |
| *FilialAlt* | −0.136*** (0.022) | −0.182*** (0.051) | −0.175*** (0.057) | −0.143*** (0.027) | −0.144*** (0.037) | −0.145*** (0.044) |
| *Physical Capital* | 0.168*** (0.050) | 0.129* (0.072) | 0.133** (0.056) | 0.149*** (0.048) | 0.150** (0.059) | 0.146*** (0.044) |
| *Human Capital* | 0.026*** (0.004) | 0.020** (0.008) | 0.020*** (0.008) | 0.018*** (0.006) | 0.017** (0.007) | 0.017*** (0.005) |
| *Sav/GDP_lag* | −0.046*** (0.012) | −0.049*** (0.017) | −0.048*** (0.015) | - | - | - |
| *Pubed/GDP_lag* | - | - | - | −0.023*** (0.007) | −0.025*** (0.009) | −0.025*** (0.007) |
| *Constant* | 4.685*** (1.350) | 6.390*** (2.194) | 6.166*** (1.902) | 4.835*** (1.389) | 5.035*** (1.717) | 5.128*** (1.310) |
| *N* | 24 | 24 | 24 | 22 | 22 | 22 |
| adj. $R^2$ | 0.88 | 0.84 | 0.85 | 0.89 | 0.88 | 0.88 |
| RMSE | 0.439 | 0.439 | 0.425 | 0.428 | 0.375 | 0.374 |
| F-stat first stage (p-value) | - | 0.086, 0.161 | - | - | 0.028, 0.026 | - |
| Underidentification (p-value) | - | 0.048 | - | - | 0.016 | - |
| Overidentification (p-value) | - | 0.635 | - | - | 0.790 | - |
| Endogeneity (p-value) | - | 0.397 | - | - | 0.242 | - |

Notes: Robust standard errors are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% levels, respectively. F-stat first stage is the joint probability of an F-test for the first stage regression. Underidentification is the probability of a test for underidentification restrictions (null hypothesis: underidentified). Overidentification is the probability of a test for overidentification restrictions (null hypothesis: instruments are valid). Endogeneity is the probability of the Wu-Hausman test for endogeneity (null hypothesis: regressors are exogenous).

to provide precise estimates. The overidentification test accepts the null hypothesis of valid instruments. Therefore, it indicates that the instrumental variables are not correlated with the error term. In other words, the exclusion restrictions are satisfied. The moment conditions, therefore, can be said to be valid, and the GMM estimator should give consistent estimates. The Wu-Hausman endogeneity test cannot reject the null hypothesis of exogenous regressors. This finding suggests that the endogeneity of the degrees of altruism should not be a large cause

**TABLE 3**
(CONTINUED)

| | (13) | (14) | (15) | (16) | (17) | (18) |
|---|---|---|---|---|---|---|
| | OLS | 2SLS | GMM | OLS | 2SLS | GMM |
| *ParentalAlt* | 0.597*** | 0.669** | 0.744*** | 0.509* | 0.694** | 0.775*** |
| | (0.180) | (0.309) | (0.275) | (0.244) | (0.335) | (0.301) |
| *FilialAlt* | −0.097*** | −0.171*** | −0.198** | −0.065 | −0.179** | −0.210** |
| | (0.027) | (0.064) | (0.084) | (0.045) | (0.090) | (0.105) |
| *Physical Capital* | 0.107 | 0.074 | 0.087 | 0.110* | 0.086 | 0.103** |
| | (0.064) | (0.077) | (0.060) | (0.058) | (0.076) | (0.052) |
| *Human Capital* | 0.023*** | 0.018** | 0.014* | 0.019** | 0.020** | 0.019** |
| | (0.007) | (0.008) | (0.008) | (0.007) | (0.008) | (0.009) |
| *Popgr_lag* | −0.301 | −0.104 | −0.069 | - | - | - |
| | (0.202) | (0.236) | (0.225) | | | |
| *Fert_lag* | - | - | - | −0.412 | 0.010 | 0.097 |
| | | | | (0.256) | (0.354) | (0.347) |
| *Constant* | 5.600*** | 6.866*** | 6.786*** | 6.486*** | 6.339*** | 5.822*** |
| | (1.914) | (2.239) | (1.885) | (2.015) | (2.300) | (1.928) |
| *N* | 24 | 24 | 24 | 24 | 24 | 24 |
| adj. $R^2$ | 0.85 | 0.79 | 0.75 | 0.87 | 0.78 | 0.73 |
| RMSE | 0.485 | 0.503 | 0.553 | 0.466 | 0.519 | 0.572 |
| F-stat first stage (p-value) | - | 0.023, 0.056 | - | - | 0.021, 0.114 | - |
| Underidentification (p-value) | - | 0.045 | - | - | 0.095 | - |
| Overidentification (p-value) | - | 0.349 | - | - | 0.379 | - |
| Endogeneity (p-value) | - | 0.800 | - | - | 0.755 | - |

Notes: Robust standard errors are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% levels, respectively. F-stat first stage is the joint probability of an F-test for the first stage regression. Underidentification is the probability of a test for underidentification restrictions (null hypothesis: underidentified). Overidentification is the probability of a test for overidentification restrictions (null hypothesis: instruments are valid). Endogeneity is the probability of the Wu-Hausman test for endogeneity (null hypothesis: regressors are exogenous).

of concern.

Our main empirical question is whether the degrees of filial and parental altruism can explain income differences across countries. Consistent with Hypothesis 1, the coefficient of parental altruism (*ParentalAlt*) remains positive and statistically significant in all specifications, indicating that the degree of parental altruism has a positive relationship with GDP per capita. A high level of parental altruism possibly

**TABLE 3**
(CONTINUED)

| | (19) | (20) | (21) | (22) | (23) | (24) |
|---|---|---|---|---|---|---|
| | OLS | 2SLS | GMM | OLS | 2SLS | GMM |
| *ParentalAlt* | 0.658*** (0.141) | 0.804*** (0.274) | 0.822*** (0.272) | 0.693*** (0.108) | 0.585** (0.231) | 0.586*** (0.161) |
| *FilialAlt* | −0.128*** (0.027) | −0.208*** (0.058) | −0.216** (0.085) | −0.127*** (0.018) | −0.121*** (0.040) | −0.123*** (0.034) |
| *Physical Capital* | 0.168*** (0.048) | 0.107 (0.083) | 0.105* (0.062) | 0.194*** (0.046) | 0.197*** (0.066) | 0.193*** (0.043) |
| *Human Capital* | 0.022*** (0.007) | 0.009 (0.010) | 0.008 (0.011) | 0.028*** (0.006) | 0.029*** (0.007) | 0.029*** (0.007) |
| *Polity* | 0.071*** (0.023) | 0.085** (0.039) | 0.087*** (0.021) | - | - | - |
| *Catholic* | - | - | - | 0.507** (0.185) | 0.516*** (0.179) | 0.516*** (0.162) |
| *Constant* | 3.258** (1.400) | 5.657** (2.532) | 5.758*** (2.064) | 2.587* (1.240) | 2.551 (1.933) | 2.685** (1.307) |
| *N* | 24 | 24 | 24 | 24 | 24 | 24 |
| adj. $R^2$ | 0.86 | 0.79 | 0.78 | 0.88 | 0.87 | 0.87 |
| RMSE | 0.468 | 0.505 | 0.522 | 0.449 | 0.396 | 0.396 |
| F-stat first stage (p-value) | - | 0.013, 0.079 | - | - | 0.028, 0.027 | - |
| Underidentification (p-value) | - | 0.060 | - | - | 0.016 | - |
| Overidentification (p-value) | - | 0.870 | - | - | 0.683 | - |
| Endogeneity (p-value) | - | 0.218 | - | - | 0.860 | - |

Notes: Robust standard errors are reported in parentheses. *, **, and *** indicate significance at the 10, 5, and 1% levels, respectively. F-stat first stage is the joint probability of an F-test for the first stage regression. Underidentification is the probability of a test for underidentification restrictions (null hypothesis: underidentified). Overidentification is the probability of a test for overidentification restrictions (null hypothesis: instruments are valid). Endogeneity is the probability of the Wu-Hausman test for endogeneity (null hypothesis: regressors are exogenous).

causes an increase in education investment and, thus, human capital accumulation, which eventually raises the countries' standard of living. Alternatively, parents in a high altruism society may allocate further time and resources toward their children, such that each child incorporates a high quality of human capital stock, becomes productive, and produces large output, resulting in a high level of GDP per capita. Consistent with Hypothesis 2, the coefficient of filial altruism (*FilialAlt*)

remains negative and statistically significant in nearly all specifications, indicating that the degree of filial altruism has a negative relationship with GDP per capita. A high level of filial altruism possibly causes an increase in spending resources and time allocation on the elderly. These activities are likely considered non-productive in terms of GDP. Simultaneously, the increased resource allocation for the elderly reduces that for children, which in turn, lowers market productivity and eventually decreases the countries' standard of living.

The coefficients of *Physical Capital* and *Human Capital* are always positive as expected, although they are not always statistically significant, suggesting that the physical and human capital accumulation processes raise GDP per capita. The coefficient of *Inflation_lag* is not negative or statistically significant, as expected. This finding implies that evidence for the notion that a high level of monetary instability that is captured by a high rate of lagged inflation lowers GDP per capita does not exist. The coefficient of lagged saving ratio (*Sav/GDP_lag*) is negative and statistically significant, which differs from that expected earlier. Given the same level of current physical capital stock, a country with high levels of lagged saving ratio may probably have an extremely low level of physical capital stock compared with those with low levels of lagged saving ratio. As a result, a country with high levels of lagged saving ratio has physical capital with inferior quality or embedded technology, which causes a low level of GDP per capita. The coefficient of lagged public education expenditure to GDP ratio (*Pubed/GDP_lag*) is negative and statistically significant. Again, this finding differs from that expected earlier. Similarly, given the same level of current human capital, a country with high levels of lagged public education expenditure to GDP ratio has an extremely low level of human capital. As a result, such a country has human capital with inferior quality, which then leads to a low level of GDP per capita. Alternatively, a high level of public education expenditure may indicate inefficiency in the education system, especially in developing countries. Inferior schools in these countries may come at a high cost. Expenditures may not be made wisely, such that they do not improve the quality of human capital and do not, therefore, contribute to the increase in GDP per capita.

The coefficient of population growth rate from the previous generation (*Popgr_lag*) is negative as expected but statistically non-significant. The coefficient of total fertility rate from the previous generation (*Fert_lag*) is statistically non-significant as well. Surprisingly, evidence of demo-

graphic difference on the steady-state level of GDP per capita does not exist in this sample. This occurrence might be explained by variations in population growth rate and total fertility rate, which are insufficiently large to ensure significance. As expected, the coefficient of *Polity* index is positive and statistically significant, indicating that a country with a high level of democracy tends to have a high level of GDP per capita. In other words, democracy reflects a relatively high extent of democratic rights, such as freedom to vote and freedom of speech, that provide a good atmosphere for business and raise the productivity of a country. The coefficient of *Catholic* is positive and statistically significant in the majority of cases, which might be caused by the ad hoc selection of country sample (in which the NTA is used). We presume that Catholic countries tend to be countries with high levels of GDP per capita.

The regression results are relatively similar across the three estimation methods used. The magnitude of the coefficients is not systematically different across estimators. Importantly, even when other control variables (*e.g.*, macroeconomic, demographic, and institutional variables) are included in the model and when various estimation methods are employed to estimate the model, the degrees of parental and filial altruism remain positive and negative, respectively, as well as statistically and significantly related to GDP per capita. This paper does not attempt to provide a comprehensive explanation of the levels of economic development. Our contribution lies in complementing the latent concepts of altruism to the existing explanation of GDP per capita. In our regression models, we include a series of controls to rule out the confounding factors that would bias our estimates of the effects of altruism on GDP per capita. We find that the degrees of altruism still have more significant effects than many other variables that were previously examined in the literature.

## V. Conclusion

In this study, we employed data from 24 countries to estimate the degrees of parental and filial altruism and its effect on the stages of economic development. We found that levels of development are positively associated with degrees of parental altruism and negatively with those of filial altruism.

To estimate the abovementioned relationship, the OLS method with heteroscedasticity robust standard errors was used. To overcome a

possible endogeneity problem, we employed 2SLS and GMM. The dependent variable is GDP per capita, and the explanatory variables are parental and filial altruism, which are controlled for by using macroeconomics, demographic, and institutional variables. We found that GDP per capita is negatively associated with filial altruism and positively associated with parental altruism. The results are robust across different models of estimation and hold even after accounting for the possible endogeneity problem of altruism. The low degree of parental altruism and high degree of filial altruism in developing countries are driven by high fertility and short life expectancy. Therefore, policymakers should jointly consider both economic and demographic policies when enacting policies to improve economic well-being in such countries.

# Appendix

**APPENDIX TABLE 1**

VARIABLES—DEFINITIONS AND SOURCES

| Variable (unit) | Definition | Source |
|---|---|---|
| *GDPpc* | The natural logarithm of GDP per capita, which is calculated using GDP divided by midyear population and averaged from 1996 to 2011. | WDI |
| *ParentalAlt* | Emotional benefit from the concurrent consumption of each child. | Koda and Uruyos (2017) |
| *FilialAlt* | Emotional benefit from the concurrent consumption of each old parent. | Koda and Uruyos (2017) |
| *Physical Capital* | The natural logarithm of gross fixed capital formation, such as plant, machinery, and equipment purchases, which is averaged from 1996 to 2011. | WDI |
| *Human Capital* | The average value of total enrollment in the tertiary level from 1996 to 2011, which is expressed as the percentage of the total population of the five-year age group that follows secondary education. | WDI |
| *Inflation_lag* | The average value of inflation rate from 1980 to 1995 as measured by the consumer price index, which reflects the annual percentage change in cost to the average consumer of acquiring a basket of goods and services. | WDI |
| *Sav/GDP_lag* | The average value of gross domestic savings from 1980 to 1995 as measured by GDP less final consumption expenditure as a percentage of GDP. | WDI |
| *Pubed/GDP_lag* | The average value of public education expenditure from 1980 to 1995 as measured by general government expenditure on education as a percentage of GDP, which includes expenditure funded by transfers from international sources to the government. | WDI |
| *Popgr_lag* | The average value of the annual population growth rate from 1965 to 1995. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. | WDI |
| *Fert_lag* | The average value of total fertility rate from 1965 to 1995 represents the average number of children that would be born to a woman if she were to live up to the end of her childbearing years and bear children in accordance with age-specific fertility rates. | WDI |
| *Polity* | An average polity score from 1996 to 2011 is computed by subtracting the AUTOC score from the DEMOC score. The resulting unified polity scale ranges from +10 (strongly democratic) to −10 (strongly autocratic). | Polity IV Project |
| *Catholic* | A dummy variable for a country with Roman Catholic as a dominant religious group. | CIA World Factbook |
| *Institutional Collectivism Values* | The degree to which organizational and societal institutional practices encourage and reward collective distribution of resources and collective action. | GLOBE |
| *In-group Collectivism Values* | The degree to which individuals express (and should express) pride, loyalty, and cohesiveness in their organizations or families. | GLOBE |
| *Linguistic Fractionalization* | Linguistic fractionalization indices range from 0 to 1 estimate the probability that two randomly selected individuals use different languages. | Alesina *et al.* (2003) |

*(Received 31 May 2018; Revised 2 September 2018; Accepted 29 September 2018)*

## References

Alesina, Alberto, Arnaud Devleeschauwer, William Easterly, Sergio Kurlat, and Romain Wacziarg. "Fractionalization." *Journal of Economic Growth* 8 (No. 2 2003): 155-194.

Barro, Robert J. and Gary S. Becker. "Fertility Choice in a Model of Economic Growth." *Econometrica* 57 (No. 2 1989): 481-501.

Becker, Gary S, Kevin M. Murphy, and Robert Tamura. "Human Capital, Fertility, and Economic Growth." *Journal of Political Economy* 98 (No. 5 1990): S12-S37.

Becker, Gary S. and Robert J. Barro. "A Reformulation of the Economic Theory of Fertility." *Quarterly Journal of Economics* 103 (No. 1 1988): 1-25.

Blackburn, Keith and Giam P. Cipriani. "Intergenerational Transfers and Demographic Transition." *Journal of Development Economics* 78 (No. 1 2005): 191-214.

Boldrin, Michele and Larry E. Jones. "Mortality, Fertility, and Saving in a Malthusian Economy." *Review of Economic Dynamics* 5 (No. 4 2002): 775-814.

Ehrlich, Isaac and Francis T. Lui. "Intergenerational Trade, Longevity, and Economic Growth." *Journal of Political Economy* 99 (No. 5 1991): 1029-1059.

Horioka, Charles Y. "Are Americans and Indians More Altruistic than the Japanese and Chinese? Evidence from a New International Survey of Bequest Plans." *Review of Economics of the Household* 12 (No. 3 2014): 411-437.

House, Robert J., Paul J. Hanges, Mansour Javidan, Peter W. Dorfman, and Vipin Gupta (eds.). "Culture, Leadership, and Organizations: The GLOBE Study of 62 Societies." Thousand Oaks, CA: Sage, 2004.

Koda, Yoshitaka and Manachaya Uruyos. "Intergenerational Transfers, Demographic Transition, and Altruism: Problems in Developing Asia." *Review of Development Economics* 22 (No. 3 2017).

Nishimura, Kazuo and Junsen Zhang. "Pay-As-You-Go Public Pensions with Endogenous Fertility." *Journal of Public Economics* 48 (No. 2 1992): 239-258.

_____. "Sustainable Plans of Social Security with Endogenous Fertility." *Oxford Economic Papers* 47 (No. 1 1995): 182-194.